



Western
Area Power
Administration

Markets— Overview and Impacts to Operations

2018 Power O&M Workshop – Nellis Air Force Base, Nevada

May 22nd, 2018

Chrystal Dean

CRSP Resource Manager

Western Area Power Administration

Montrose, CO

Cdean@wapa.gov

Agenda

- What is driving the industry move to Markets in the West
- What does this mean for WAPA
- Overview - Regional Transmission Organization (RTO)
- What does an RTO mean for generator Operations
- Q&A



What's driving the industry move?



Change drivers

The industry is replacing coal as a primary generating fuel with natural gas, wind, and solar.

- ✓ Low natural gas prices
- ✓ Coal industry financial challenges
- ✓ Improved performance of wind and solar
- ✓ Environmental requirements and incentives

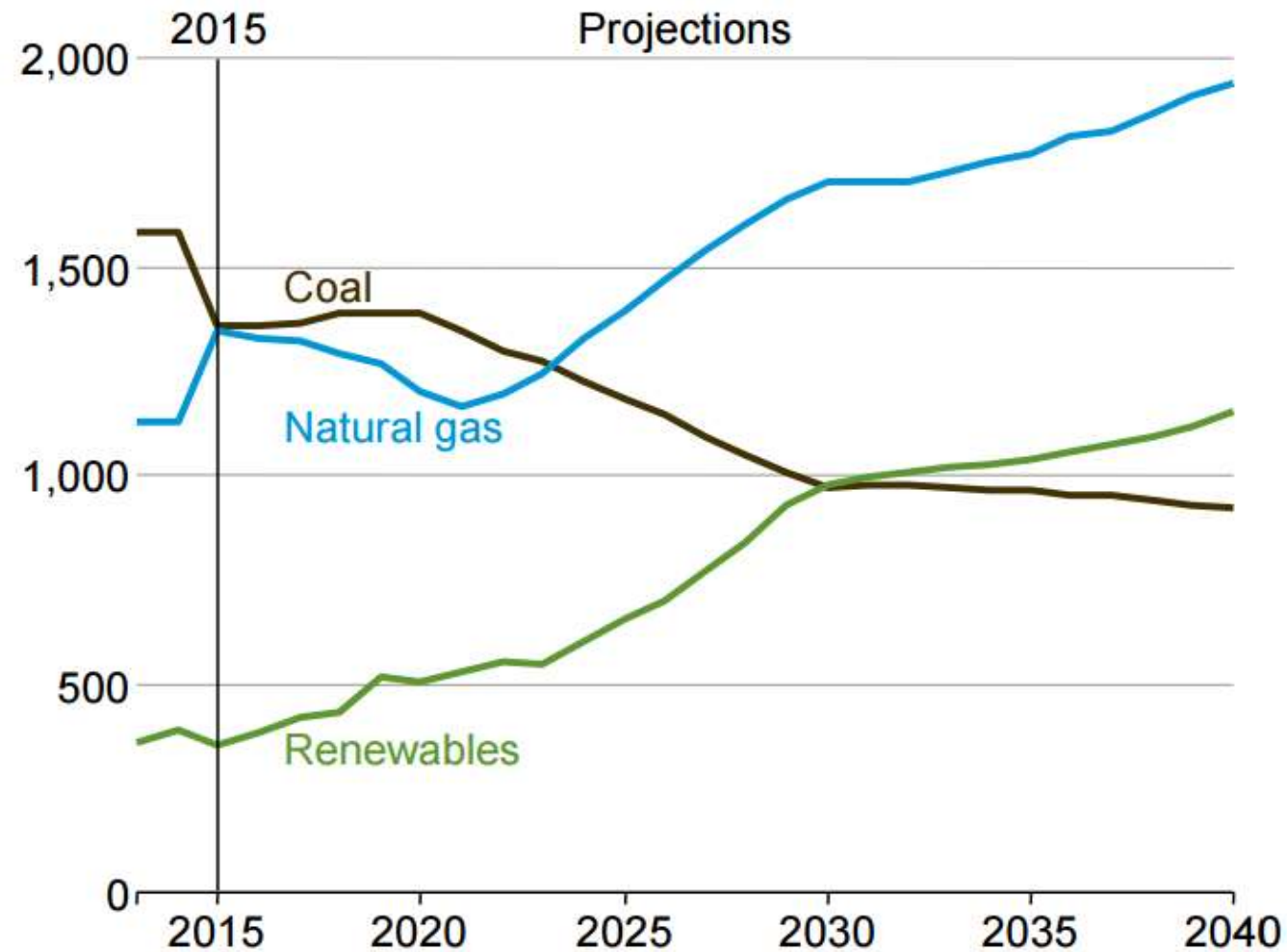


"If you don't like change, you're going to like irrelevance even less."

General Erick Shinseki, Secretary of Veterans Affairs



Generation Mix Forecast



Source: US Energy Information Administration, [Annual Energy Outlook 2016](#)

What does this mean to WAPA?



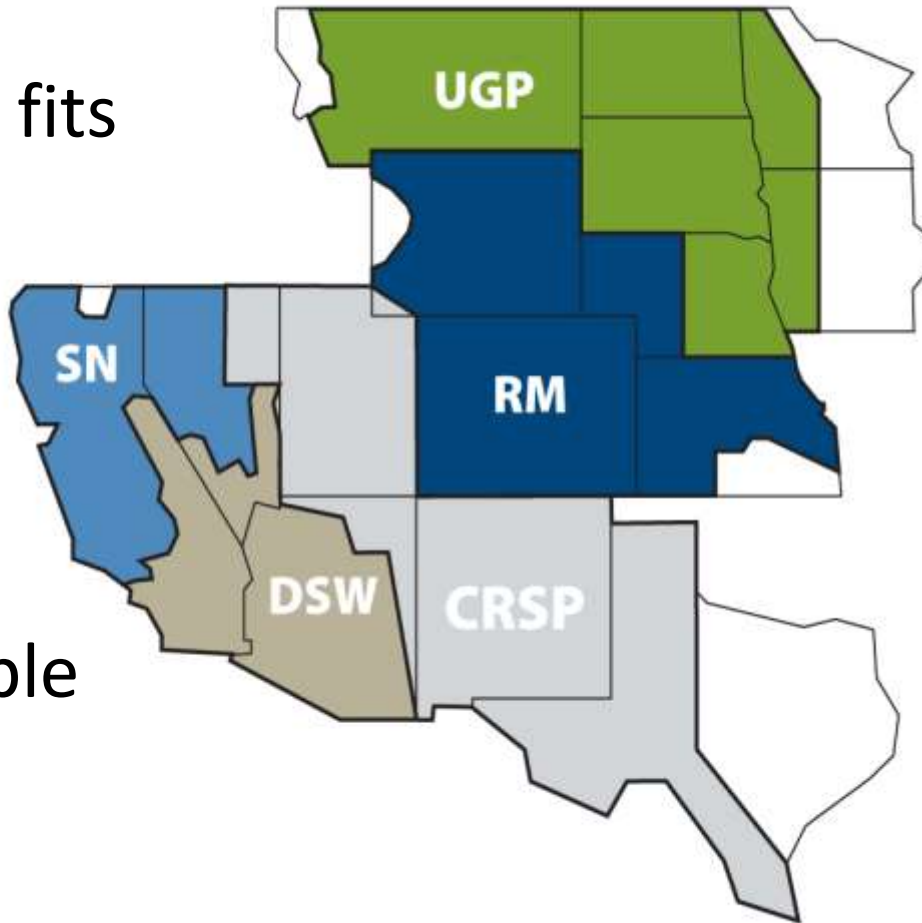
Implications for WAPA

- Changes in the generation mix are motivating the development of regional markets.
- Power marketing:
 - Regional market expansion reduces WAPA's access to bilateral trading partners.
 - WAPA purchases significant amounts of wholesale electricity. Per unit costs and price volatility are risks.
- System operations:
 - The location and type of replacement generation affects transmission sales, operations, and planning.
 - WAPA's Balancing Authorities (BA) will be affected by a system that is increasingly dynamic.



WAPA's Position on Markets

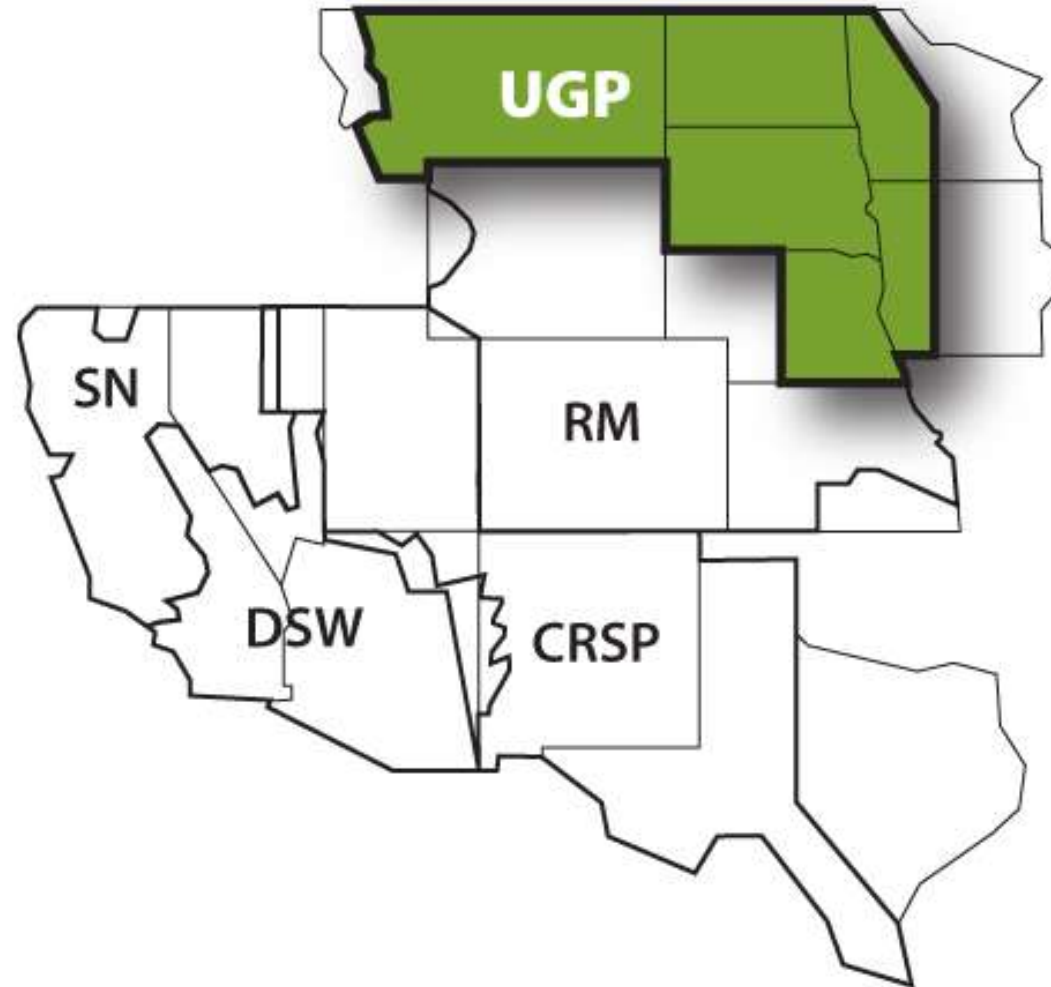
- Each region is unique and there will not be a 'one size fits all' solution.
- We are staying strategic, proactive, and in alignment with our mission.
- Goal: Create the best possible outcome for our customers and our organization.



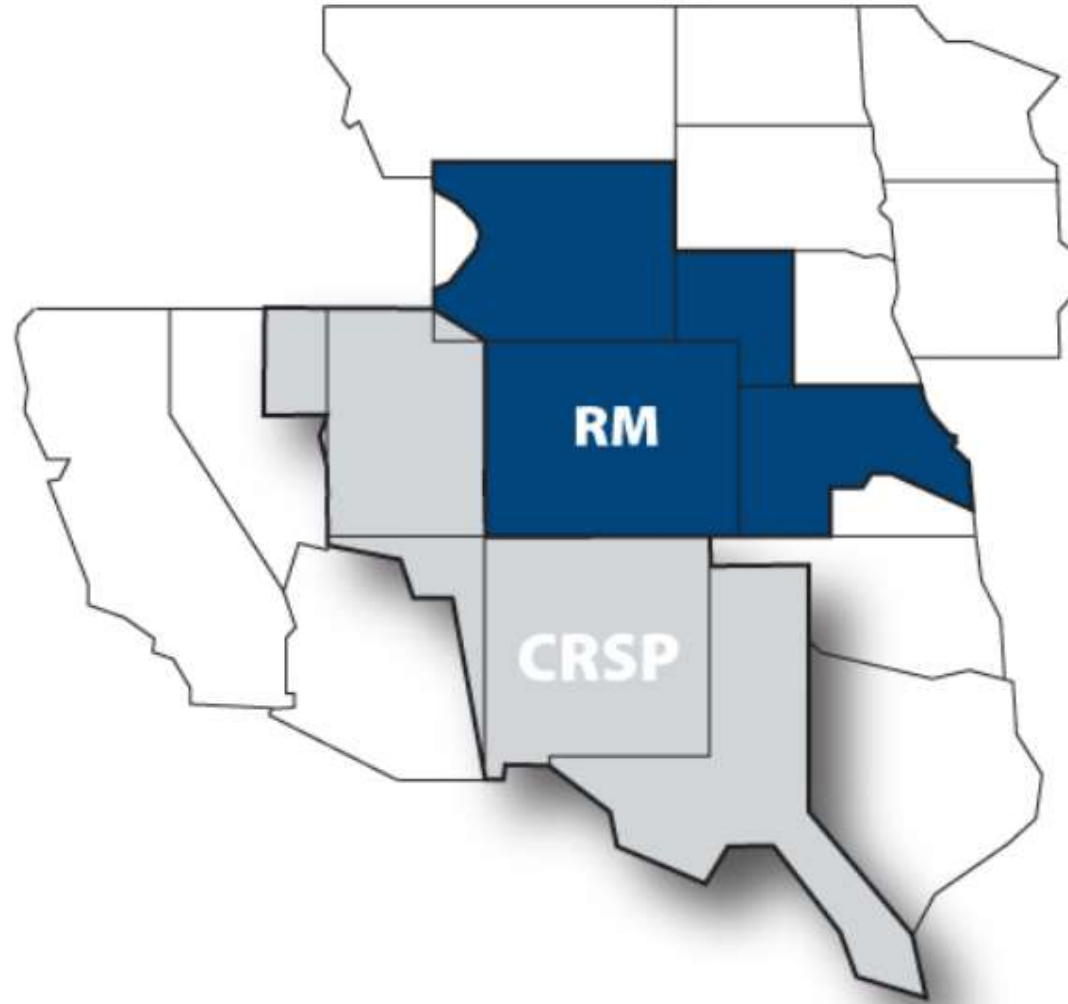
WAPA Regional Activities



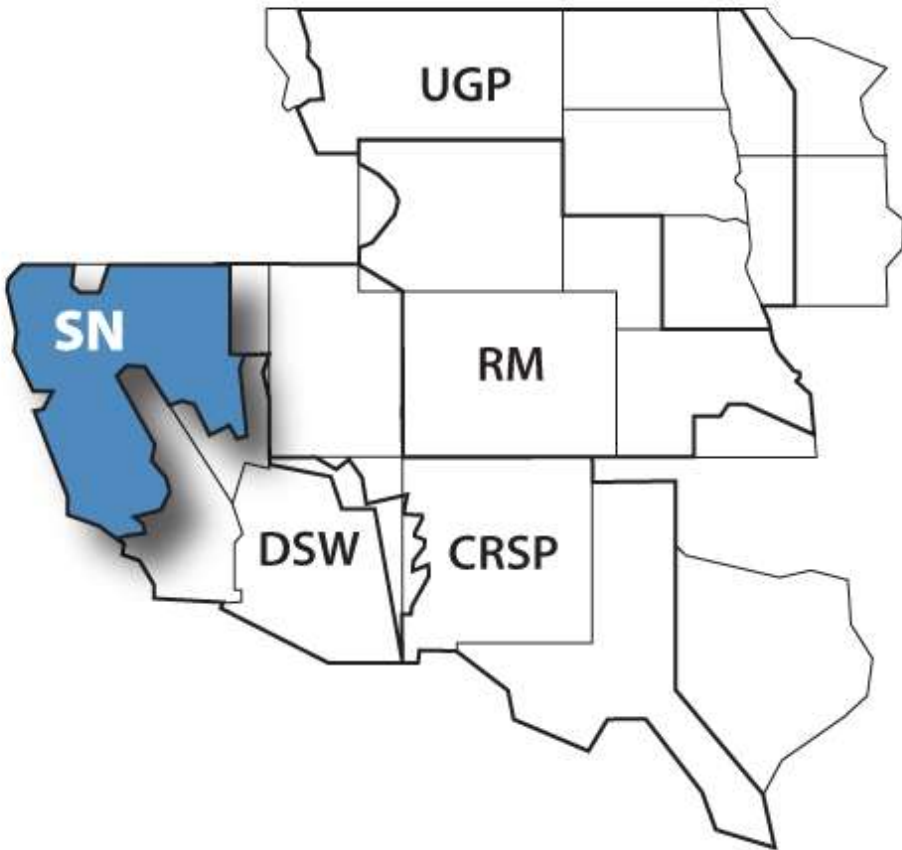
Upper Great Plains Region



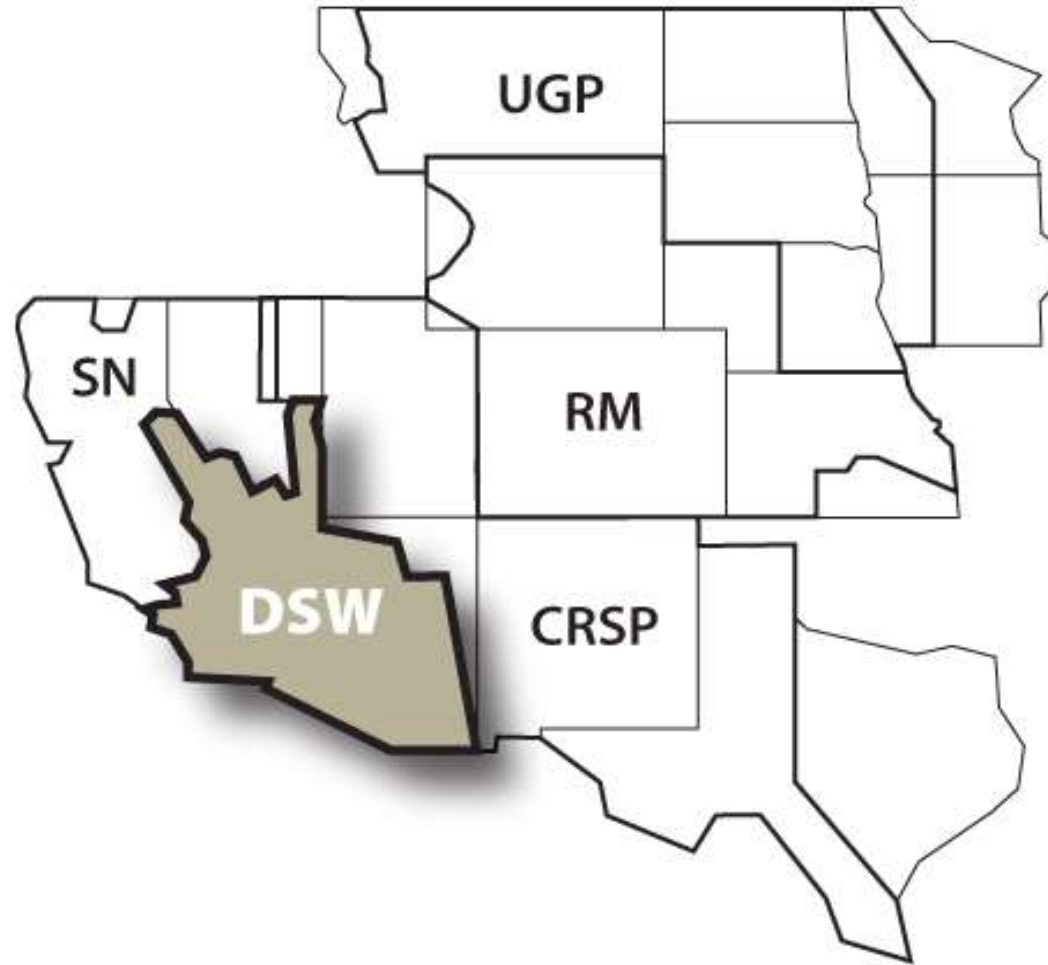
Loveland Area Projects and the Colorado River Storage Project



Sierra Nevada Region



Desert Southwest Region



Overview- Regional Transmission Organizations (RTOs)



What is an RTO?

- An **independent operator** of the transmission system and generation resources.
 - RTOs do not own transmission and generation.
 - RTOs operate the system on behalf of utilities.
- The **Reliability Coordinator (RC)** for the operating footprint.
 - Wide-area overview of the entire footprint.
- Facilitates **transmission planning**.
- Performs **Market Monitoring**.
- Operates and **oversees a centralized market** for energy and ancillary services.

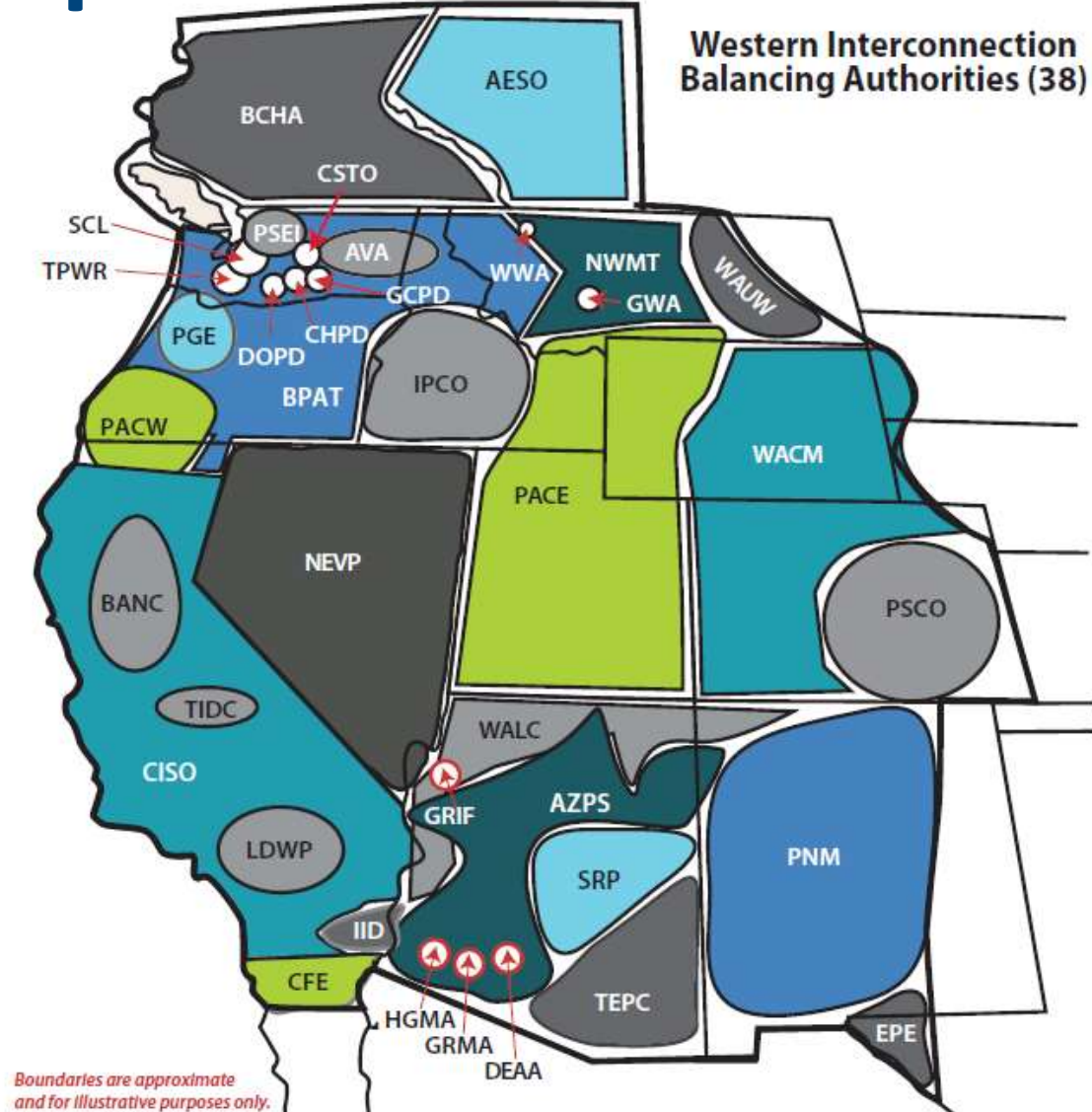


North American Independent System Operators (ISO) and Regional Transmission Organizations (RTO)



The West *is* Unique

- 38 Balancing Authorities
- 50 transmission operators
- The fragmented system is not well-positioned for change



What are the benefits of an RTO?

- More efficient generation commitment and dispatching
- Improved system reliability
- More efficient renewable energy integration



Electric Industry Market Structures: Bilateral vs. Centralized Markets in RTOs

Bilateral Markets	RTO Centralized Markets
One party sells to another party (like buying a car)	Electricity products cleared by a centralized market operator (like the stock market)
Hourly transactions - poorly matched to increasing amounts of renewable generation	5 minute transactions - much more responsive to changing system conditions
Fragmented operating footprints result in operating inefficiencies	Larger operating footprints with diverse resources are more efficient and more reliable
Limited visibility to conditions on neighboring systems can create reliability issues	Wide area situational awareness and control of the system has reliability benefits



A closer look – How do RTOs manage it all?

Maintain reliability
+
Meet energy demand
+
Manage congestion
+
Lowest-cost resources
=
???



Understanding SCED

One large component RTOs use is:

SCED= Security Constrained Economic Dispatch

- Minimizes cost to serve customer load, while maintaining reliability of the electrical system.



Day-Ahead Market

Day before Operating Day

OCTOBER 7



By 0930:
Market Participant (MP) Activity

- ✓ **Offers** to sell energy
- ✓ **Bids** to buy energy

Between 0930 – 1400:
RTO runs day-ahead (DA) market

- ✓ **Matches** up offers and bids
- ✓ Reduces total energy costs, while maintaining **reliable** operations
- ✓ Computes and publishes **DA prices**
- ✓ Is **financially binding**



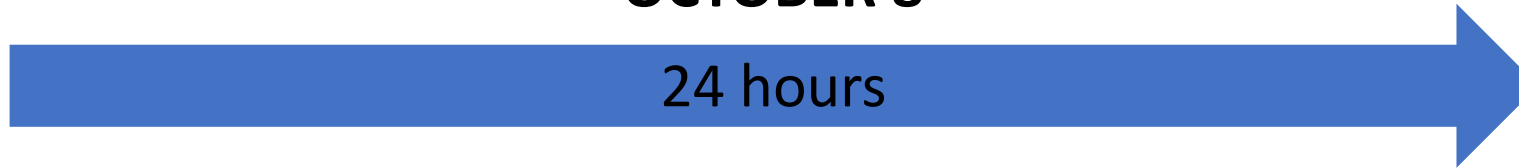
Real-time Balancing Market

Operating Day

**Helps RTO/Market
Operator fulfill
Balancing
Authority (BA)
responsibilities*

OCTOBER 8

24 hours



All Day: MP activity

- ✓ Resources committed from DA come online per schedules
- ✓ Resources **follow** all market **instructions**

All Day: RTO runs RTBM

- ✓ Balances generation and load in RT while maintaining reliability
- ✓ Sends Dispatch Instructions (from SCED)
- ✓ Sends Set point Instructions
- ✓ Computes and publishes prices every five (5) minutes



How does SCED work?

- Security Constrained Economic Dispatch (SCED)
 - Goal: Minimize Generation cost while also respecting transmission constraints.
- Inputs
 - Generation to be Dispatched-What units are available- “The Menu” of Resources need to serve “The Load”
 - Generator Offer Curves-\$ Costs-Start Up-Min Run Time
 - Generator Limits- 500Mw might only be good for 490Mw
 - Generator Current Output-Currently producing 350Mw
 - Active Transmission Constraints-Limitations or Congestion



Results of SCED

- A solution that contains:
 - **Recommended changes** to dispatch rate
 - A list of all **active constraints** on the system
 - A list of all units to be used for **constraint control**
 - Individual generation **set points and dispatch rates** for all units
 - Real-time market **Alternative solutions** for the RTO Generation Dispatcher

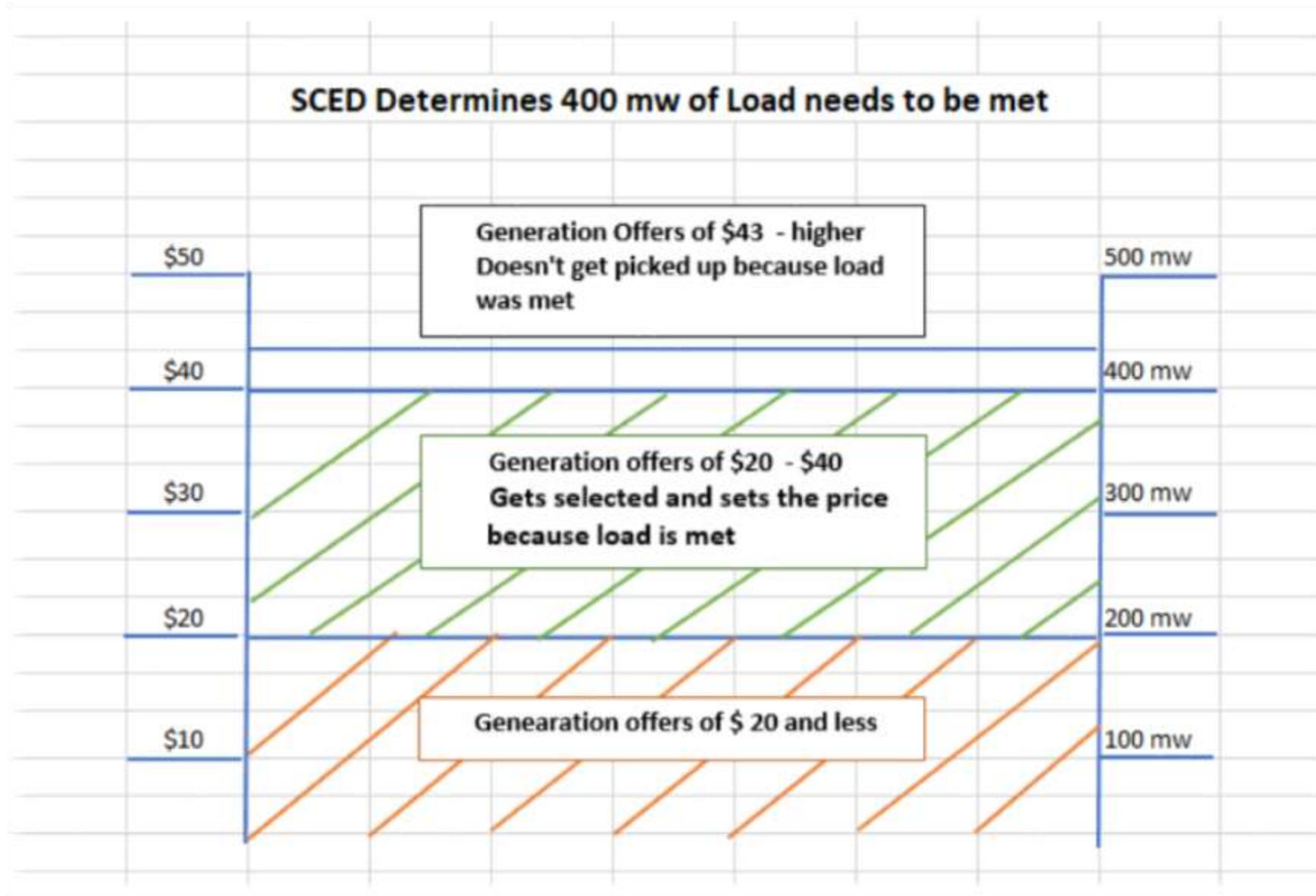


The Big Question...

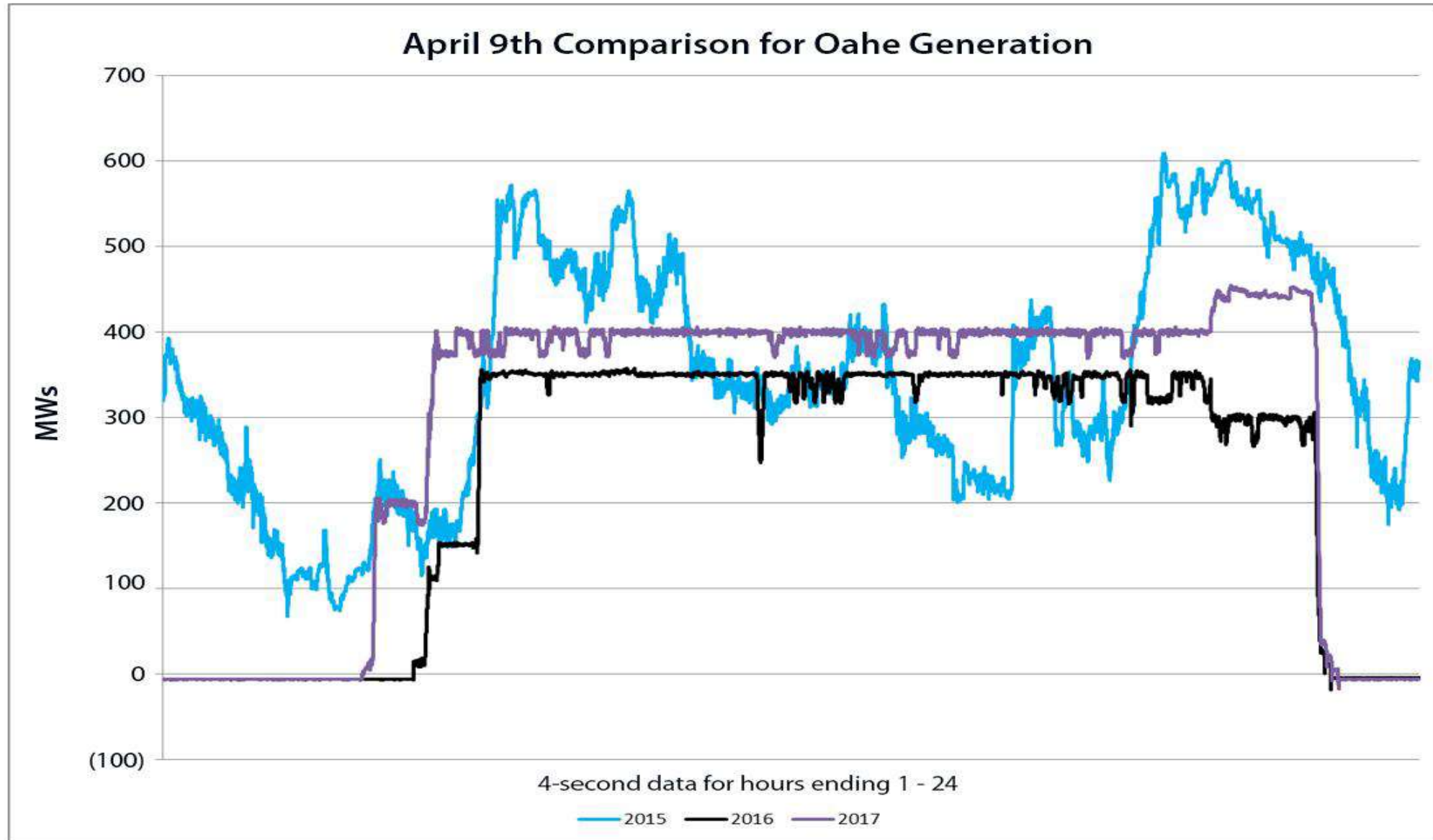
- What does this mean for your operations?
 - Strong and efficient coordination with WAPA/PMAs
 - Even more crucial that outages, maintenance and differences in release rates are known ahead of time
 - Coordination across projects – not just generation
 - Might expect less hour to hour generator movements are likely



Unit Selection



Oahe Generation



Q&A

Chrystal Dean
CRSP Resource Manager
Cdean@WAPA.gov

